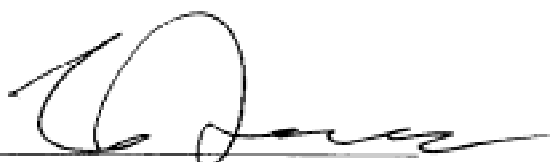


**LOW DOSE-RATE FACILITY (LDRF) - BLDG 277/ROOM B11:
OPERATION PROCEDURE**

10 June 1998

LDRF OPERATION PROCEDURE APPROVAL SIGNATURES:



Charles Barnes, Supervisor
Radiation Testing and Failure Analysis Group

Date: 6/15/98



Fred W. Sanders, Radiation Safety Officer,
Radiation Safety Committee

Date: 6/17/98



Bruce E. Anspaugh, Chairman
Radiation Safety Committee

Date: 6/23/98

Parts Engineering Office (507)
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, CA 91109

I. APPROVED OPERATORS:

Only operators approved by the JPL Radiation Safety Committee listed below may expose any of the sources. These operators cannot designate others to act in their place.

Dr. Charles E. Barnes	4-4467
Choon I. Lee	4-0108
Michael D. O'Connor	4-5595
Tetsuo F. Miyahira	4-2908
Duc N. Nguyen	4-8554
Bernard G. Rax	4-0482
Luis E. Selva	4-5751
Gary M. Swift	4-5059
Michael C. Wiedeman	4-1830

The JPL Radiation Safety Committee must approve any additions to this list.

This Operation Procedure is for the radiation sources located in Bldg. 277, Room B11 and consists of 150 Curies of Cobalt 60, dated 4/96 and is designated the Low Dose Rate Facility (LDRF).

II. LDRF OPERATION KEYS:

1. Cell Door Key

Two keys exist. They are issued to Dr. Charles E. Barnes (attached to metal tab) and Fred Sanders. Additional keys can be issued only with written consent of the Radiation Safety Committee.

2. Control Panel Key, Units 1 and 2

Two keys exist. One is issued to Dr. Charles E. Barnes (attached to metal tab). The other is stored in Locks and Keys.

3. Source Padlocks, Units 1 and 2

Two keys exist. One is issued to Dr. Charles E. Barnes (attached to metal tab). The other is stored at Locks and Keys.

The control panel, test cell door and padlock keys, assigned to Dr. Charles E. Barnes, are permanently affixed together as a set on a metal tab which is stored in 300-119, and is available only to approved operators. The operator shall keep the metal key tab on his person at all times during test preparation and source operation. The key set shall not be removed from the JPL facility. If the operator leaves JPL during testing, the keys shall be returned to 300-119 prior to leaving JPL.

III. INITIAL SOURCE START UP:

CAUTION -- The source operator shall insure that all personnel who enter the test cell are wearing a pocket recording dosimeter or film badge. In the event that a large group is to enter the facility, only one pocket dosimeter need be issued to a group member. The reading from this dosimeter will be used for all group members.

1. The certified operator shall retrieve the metal tab with the keys from storage in 300-119. The operator will be the first person to enter the radiation cell, and the last to leave. **The operator is to have the keys in his possession at all times.**

NOTE:

If at any step a safe condition is not displayed, stop the start up procedure. If the problem cannot be determined and corrected, notify the JPL Radiation Safety Officer, Fred Sanders, at X4-2065. This warning applies to all following steps and will not be repeated except at critical points.

2. Press the power toggle switch to energize control panel functions.
3. Press the white CLOSE button on the console and verify that the EXPOSE lights (red) go out and the CLOSE lights (amber) come on. Press the green button on the Victoreen meter to reset the interlocks and verify that red lights above door and on the door lock go out and the green light on the lock is illuminated.
4. If all indications are safe, then open radiation cell door using the key switch and press the black electric interlock button below the green light (only operates if the green light is on). When the buzzer sounds, open door and lock door open for convenience in moving in and out of the radiation area.
6. Survey the hallway (B10) radiation cell (B11) holding the survey meter at arm's length when entering the exposure area to check for a safe radiation level (below 1 mr/h). If reading is above this level, immediately close the door and contact the JPL Radiation Safety Officer, X4-2065.
7. If a safe level is indicated, enter the radiation cell and immediately verify that the tower interlock switch is OFF (down) and the green light is out.
8. Proceed to set up the irradiation test.
9. Prior to leaving the radiation cell verify that no personnel are in the area.
10. Turn tower interlock switch ON, immediately exit the exposure area and turn out the lights. Leave the hall light on so the second Victoreen meter can be observed through the door and close radiation cell door.
11. Insure that the compressed air is set to 75-80 psig.
12. For pre-timed source exposure, turn the TIMER SWITCH on the control panel to the PRESET position, set the desired time and reset the timer manually. The timer will automatically close the source when the preset time has elapsed. The timer must be reset after each irradiation. In addition, the TOTAL ELAPSED TIME mechanical counter is set as a back up lapsed time indicator, and lapsed time recorded in the logbook.
13. For manual operation, set the TIMER SWITCH on the control panel to MANUAL and reset the timer manually. Use the TOTAL ELAPSED TIME counter on the console panel to keep track of the exposure time.

IV. SOURCE EXPOSURE SEQUENCE:

1. Insert the control key in the OFF-EXPOSE switch, turn to EXPOSE, release and keep the metal tag on your person. The switch will automatically return to CLOSE when released, and following sequence is initiated:
 - a. The red lights above the cell door and on the door lock will come on.
 - b. A warning buzzer will sound at the control panel and in the radiation cell for 20 seconds prior to start of the source being raised into the exposed position.
 - c. After this 20-sec. warning period, the pneumatic system will begin to raise the source into the exposed position. In a few seconds the source will be raised (exposed) and the red Unit 1 or Unit 2 EXPOSED light will illuminate. At present, Unit 1 is non-operational, so this light will never illuminate.
 - d. The reading on the Victoreen meter will increase significantly indicating a high radiation field.

- e. The timer will start if the PRESET switch position is used.

V. EXPOSURE TERMINATION:

1. Exposure can be terminated in two ways: 1) automatically by the timer, in preset mode, 2) manually by pushing the white console CLOSE button.
2. Verify that the Victoreen meter is reading below 10 mr/h, the red lights above the cell door and on the lock are off and the red EXPOSED panel light is off. Then press the green reset button on the Victoreen, and observe that the meter drops below 10 mr/h.
3. If all indications are safe open the radiation cell door using door switch lock key, which shall on the operator's person.
4. Prior to entering the radiation cell, hold the portable survey meter at arm's length in the doorway to check for a safe radiation level below 1mr/h. If reading is above this level, immediately close the door and contact the JPL Radiation Safety Officer, X4-2065.
5. If a safe level is indicated, enter the radiation cell and turn the tower interlock switch to "OFF" immediately before proceeding with any other activities.

VI. REPEATED EXPOSURE:

If another exposure is required, make the desired test setup changes, verify that no personnel are in the radiation cell area, turn on the tower interlock switch as the last action before leaving the cell and close the cell door. Repeat steps **III**. 12 and 13.

VII. SHUTTING DOWN SOURCE:

1. After completion of steps **V**. 1 through **V**. 5:
 - a. Lock the source down using the tower padlock, remove test equipment, verify that no personnel are in the area and close the radiation cell door.
 - b. Turn off POWER switch
 - c. Turn off compressed air.
 - d. Return the key set to storage in 300-119.

VIII. SAFETY:

1. INTERLOCKS - The following interlocks are built into the radiation source control system:
 - a. *Toggle Switch on Irradiator Tower:* In the down (off) position, this switch turns off the source exposure system so that the source cannot be exposed, or it returns the source to the fully shielded position if the switch is turned off during an irradiation. Before leaving the room prior to an exposure sequence, this switch must be moved to the UP (ON) position
 - b. *Door Interlock Switch:* The source exposure activation sequence cannot be initiated unless the door is completely closed and the interlock switch engaged. The source will shut down immediately if the door is opened during exposure.

c. *Victoreen Low Level Alarm*: This switch is internal to the Victoreen console meter, and immediately shuts down the source or activation sequence, and also does not allow start up if the Victoreen unit is not functioning.

2. **ELECTRICAL**: If main power is lost, a safety interlock switch activated, or the radiation sequence aborted, a latching relay drops out and the source is immediately forced down into the fully shielded position. This is accomplished by gravity, the constant tension springs built into the tower and pneumatic pressure. If the system is shut down by either power loss or any interlock switch activation, it will be necessary to RESET the system using the key switch

3. **MECHANICAL**: If for any reason pneumatic pressure is lost, the source is pushed immediately down into the fully shielded position by gravity and the constant tension springs

NOTE: If pressure is interrupted during irradiation exposure the source will return to the fully shielded position. However, the source will be re-exposed if pressure returns and no interlock has been activated.

IX. LDRF EMERGENCY PROCEDURE:

If there is obvious or suspected damage to the radiation source, secure the area immediately.

IN CASE OF SOURCE MALFUNCTION IMMEDIATELY NOTIFY ONE OF THE PERSONNEL LISTED BELOW (in order of preference):

Name	JPL Ext.	Home Phone #	Pager #
Fred Sanders (Radiation Safety Officer)	4-2065	(626) 351-8250	800 759-8888 Pin # 1589179
Mark Phillips (Alternate RSO)	4-1181		800 759-8888 Pin # 1065859
Allan Johnston (Group Leader)	4-6425	(818) 248-7054	
Dr. Charles Barnes (Group Supervisor)	4-4467	(626) 398-7991	(888) 894-2967
James Coss	4-7463	(626) 796-1056	
Bernard Rax	4-0482		(818) 384-0527
Choon Lee	4-0108	(818) 893-1176	
Michael Wiedeman	4-1830	(626) 334-3342	
Michael O' Connor	4-5595	(909) 988-8199	

IN CASE OF PERSONNEL RADIATION EXPOSURE NOTIFY:

Medical Services	4 -3319 and
Radiation Safety Officer	4 -2065